16. RELATIVE ABUNDANCE OF HOUSEFLIES IN INDIA AND THEIR SUSCEPTIBILITY TO DDT, BHC, AND DIELDRIN[1]

A study of the relative abundance of various species of houseflies in different parts of India is extremely desirable from the standpoint of control and to find out if any species concerned with the transmission of disease has developed increased tolerance to insecticides. Hence, the present survey of the relative occurrence of the more important forms *Musca domestica nebulo, Musca domestica vicina,* and *Musca sorbens* in different states of India and the susceptibility of the predominant housefly, *M. d. nebulo*, to DDT, BHC, and dieldrin.

The flies were collected from bazaars at different places and brought to Aligarh for making population counts. At each place, the flies were collected three times a day, the duration of each period of collection being 30 minutes. Eggs obtained from such flies were placed in glass jars containing moist cotton and the larvae were reared on cotton pads soaked in diluted milk and sugar to produce adult progeny. Four-day-old flies belonging to the form *nebulo* were tested with topical applications of 0·1% solutions of DDT, BHC, and dieldrin. Mortality counts were made after 24 hours of treatment and the results obtained are presented in the accompanying Table.

The following results were obtained:

1. *Musca domestica nebulo* is the most common form of housefly, comprising more than 50% of the fly population at most of the places surveyed. It is abundant particularly in Andhra Pradesh, Bihar, Delhi, Gujarat, Rajasthan, and parts of Uttar Pradesh.

2. The population of *M. d. vicina* tends to increase with increase in altitude, so much so that at Dalhousie in Panjab, Simla in Himachal Pradesh, Chakrata and Mussoorie in Uttar Pradesh, it is far more abundant than *nebulo*. *vicina* is the predominant form of housefly in Bengal.

3. *Musca sorbens* is essentially a fly of the plains, being entirely absent at higher elevations. It is very common in Panjab and forms as much as 78% of the fly population in Chandigarh.

4. *Musca domestica nebulo* can be effectively controlled by chlorinated hydrocarbon insecticides. It was found to be susceptible

[1] The authors wish to express their sincerest gratitude to the authorities of the National Institute of Health, U.S.A., and to Dr. A. W. A. Brown and Dr. M. A. Basir for their assistance and guidance during the progress of this work.

TABLE

RELATIVE ABUNDANCE AND SUSCEPTIBILITY LEVELS OF HOUSEFLIES *Musca domestica* IN INDIA

State	Place	Altitude* in metres	No. of flies collecte	Percentage abundance			% mortality of *M. d. nebulo* with 0·1% solution of insecticide		
				M.d. nebulo	*M.d. vicina*	*M.d. sorbens*	DDT	BHC	Dieldrin
Andhra Pradesh ..	Hyderabad ..	542	1750	83·1	14·6	2·3	61·3	85·0	78·3
Bengal ..	Calcutta ..	6·5	5700	25·2	69·3	5·5	64·0	93·7	80·0
Bihar ..	Patna ..	53	1830	92·2	1·6	5·4	83·3	100·0	100·0
	Muzzafarpur ..	53	2030	93·5	2·4	3·8	79·3	100·0	82·6
	Bhagalpur ..	49	315	87·3	4·7	7·9	64·8	100·0	78·5
	Katihar ..	32	460	66·3	33·0	0·6	73·0	100·0	76·9
	Siwan ..	77	1440	55·5	44·3	0·0	72·7	100·0	94·1
	Gaya ..	111	2090	81·3	4·6	14·3	71·1	98·2	76·0
	Ranchi ..	655	1625	86·1	3·0	10·7	71·6	100·0	79·5
Delhi ..	Delhi (Old) ..	218	740	76·6	15·0	8·3	43·2	80·3	79·2
	Delhi (New) ..	218	890	73·5	23·03	3·3	37·5	84·0	75·9
Gujarat ..	Jamnagar ..	18	728	75·9	21·1	2·8	45·2	94·1	69·5
	Ahmedabad ..	50	1071	83·0	15·6	1·3	41·3	91·06	72·2
	Baroda ..	35	920	51·2	8·4	40·4	75·3	100·0	85·7
Himachal Pradesh.	Simla ..	2202	350	31·4	68·6	0·0	55·3	87·8	95·0

TABLE—(*contd.*)

State	Place	Altitude* in metres	No. of flies collected	Percentage abundance			% mortality of *M. d. nebulo* with 0·1 % solution of insecticide		
				M.d.nebulo	*M.d. vicina*	*M. d. sorbens*	DDT	BHC	Dieldrin
Madhya Pradesh ..	Bhopal ..	501	3000	59·4	38·3	2·3	50·0	96·2	57·4
Madras ..	Madras ..	15·5	1335	72·3	15·4	12·3	68·1	93·3	81·2
Maharashtra ..	Poona ..	552	749	78·0	7·3	14·7	43·6	59·3	49·3
	Bombay ..	11	2400	63·5	15·1	21·2	45·07	92·0	81·1
Mysore ..	Mysore ..	767·5	537	79·3	17·1	13·6	54·1	80·6	68·7
	Bangalore ..	921	748	61·3	35·5	3·2	65·3	91·5	72·5
Orissa ..	Bhubaneswar ..	30·5	750	60·2	31·6	8·2	71·4	97·4	79·7
	Cuttack ..	26·5	2050	57·2	20·5	22·3	54·4	98·8	69·8
Panjab ..	Ludhiana ..	247·5	1890	59·4	9·3	31·1	68·8	100·0	85·7
	Amritsar ..	230·5	2500	42·3	0·6	57·1	41·5	96·6	76·9
	Jullundhur ..	230	2000	65·6	1·2	33·2	61·8	100·0	86·6
	Pathankot ..	331	200	69·7	30·3	0·0	60·0	100·0	100·0
	Chandigarh ..	378·5	1800	8·7	13·2	78·1	71·1	100·0	88·5
	Dalhousie ..	2145	290	53·4	46·6	0·0	52·8	98·1	100.0

TABLE (*contd.*)

State	Place	Altitude* in metres	No. of flies collected	Percentage abundance			% mortality of *M. d. nebulo* with 0.1% solution of insecticide		
				M.d.nebulo	*M.d. vicina*	*M. d. sorbens*	DDT	BHC	Dieldrin
Rajasthan ..	Ajmer ..	485·5	210	97·1	2·9	0·0	73·07	93·8	87·9
	Jaipur ..	436	460	99·5	0·0	0·5	69·7	95·7	80·5
Uttar Pradesh ..	Varanasi ..	76	832	81·2	9·1	9·6	79·0	97·6	86·6
	Aligarh ..	187·5	533	54·4	36·0	9·5	48·3	82·0	80·0
	Agra ..	168·5	315	67·4	23·2	9·4	74·3	100·0	81·1
	Bareilly ..	173	387	85·7	6·4	7·7	86·5	100·0	100·0
	Rampur ..	188	498	96·4	3·6	0·0	62·2	100·0	100·0
	Saharanpur ..	274	410	38·04	45·3	16·4	65·5	100·0	98·9
	Dehra Dun ..	683	376	35·6	63·8	0·53	48·1	100·0	95·3
	Mussoorie ..	2115	176	45·4	54·5	0·0	57·2	100·0	94·4
	Chakrata ..	2157	208	5·7	94·2	0·0	43·7	98·6	92·0

* Taken from the Survey of India Maps, Calcutta, and the Tables of Observatories in India, New Delhi.

to DDT, BHC, and dieldrin, except at Poona where it showed considerable tolerance to these chemicals. But as no strong tests were made, it is not clear if the increased tolerance of these flies is a case of true resistance and was simply due to the vigour tolerance of the population collected.

5. Of the three chemicals tested, BHC was the most toxic; a concentration of 0·1% of it killed 80·0 to 100·0% of the flies at all places except Poona, where the percentage mortality was only 59·3%.

Department of Zoology,
Muslim University,
Aligarh,
January 1, 1964.

N. H. KHAN
J. A. ANSARI
J. REHMAN
D. AHMAD

17. NEW PLANT RECORDS FROM ERSTWHILE BOMBAY STATE

(*With two plates*)

During the course of intensive floristic studies in the Ratan Mahal and surrounding hills, Panch Mahal District, Gujarat State, these plants were collected. After identification, these specimens were checked at F. R. I. Herbarium, Dehra Dun, but in order to remove some minor doubts the specimens were sent to the Royal Botanic Gardens, Kew, for confirming the determination. As far as could be ascertained from the available literature we think that the plants are new records for Bombay State. It is hoped that the illustrations and extensive field notes may help workers on floristic studies in this part of the country to trace the distribution of these plants.

I. **Sonerila tenera** Royle, Illustr. Bot. Himal. 215, t. 45, f. 2 (1839); Hooker, F.B.I. 2:530 (1879).

A small delicate herb. Stem erect, glandular-pilose, slightly winged. Leaves thin, membranous, ovate, entire, less than 1·5 cm. long, with a few scattered lax hairs. Inflorescence scorpioid. Flower small; calyx tube slightly trigonous, with few scattered lax hair. Petals 3, 2×4 mm. ovate acute, rose purple; stamens equal. Capsule about 5 mm. long, trigonous. Seed ovoid, smooth, dark-brown (Plate I).

The plants were found growing in moist dense shady places in the rocks on the way to Patan Mata Hill, Ratan Mahal Hills, Panch